REAL AND ACCOUNTING EFFECTS OF MANDATORY DERIVATIVES DISCLOSURES

BY

RALUCA CHIOREAN

DISSERTATION

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Doctoral Committee:

Professor Theodore Sougiannis, Chair
Professor George Pennacchi
Assistant Professor Michael Donohoe
Assistant Professor David Koo

ABSTRACT

I examine whether SFAS 161 derivatives disclosures affect corporate risk management behavior. First, I find that the adoption of SFAS 161 has real effects on firms' risk management strategy, resulting in lower overall derivatives use and speculation with derivatives. Second, I find that SFAS 161 also has an accounting effect as managers seem to avoid hedge accounting, and prefer to use non-designated derivatives after the introduction of the standard. Finally, I develop a new method to determine whether the accounting designation of derivatives informs financial statement users of their economic use (speculate or hedge). My findings show that, while the accounting designation of derivatives is informative of their economic use in general, it is less informative after the adoption of SFAS 161. Overall, firms' response to SFAS 161-derivatives disclosures is mixed. On the one hand, firms engage in more prudent risk management, decreasing the extent to which they speculate with derivatives. On the other hand, firms reduce the extent of overall derivatives use, which may lower the benefits associated with hedging derivatives.

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1. INTRODUCTION

Derivative financial instruments are well known for their economic complexity, especially when used in intricate hedging and speculative transactions. These complexities appear to be the cause for a long series of financial accounting standards that deal with accounting and disclosure issues relating to derivatives and hedging activities. Specifically, the FASB has issued *ten* derivatives related standards over the period 1981-2008 and is currently considering additional regulatory guidance (FASB 2015). SFAS 161, the last standard in the series, significantly increases disclosure requirements for derivatives and hedging activities. In my study, I use derivatives data collected from a sample of 1,000 large non-financial firms' 10-K reports covering the period from 2001 to 2013 to investigate the impact of SFAS 161-mandated derivatives disclosures on these firms' risk management activities. Specifically, I examine the real effects of SFAS 161 on overall derivatives use and speculation with derivatives and its accounting effects on the designation of derivatives. The results are of interest not only to users of financial statements who need information to evaluate a firm's risk management, but also to the Financial Accounting Standards Board (FASB) as it amends accounting and disclosure requirements for derivatives. The fact that the FASB is currently considering additional regulation indicates that SFAS 161 has not solved disclosure issues that existed before its issuance and/or it created new issues.

The introduction of SFAS 161 has generated a debate over how mandatory hedge disclosures affect firms' risk management activities. On the one hand, critics argue that mandatory derivatives disclosures pose high proprietary costs (comment letters to the exposure draft (ED) of SFAS 161) and may result in a decrease in derivatives use, as managers try to protect their private information and raise entry barriers (Hoang and Ruckes 2013)[1]. On the other hand, mandatory derivatives disclosures

[1]In this paper, I use the term *hedging* derivatives (as opposed to speculative) to refer to derivatives that reduce a firm's risk exposure and *designated* derivatives (as opposed to non-designated) to refer to derivatives designated as accounting

may not result in a decrease in derivatives use if the hedging benefits outweigh the costs of disclosure. For example, prior literature has documented a number of benefits associated with derivatives use, like lower risk (Guay 1999), lower current and cash effective tax rates (Donohoe 2015), and lower underinvestment (Nance et al. 1993). Given these documented benefits of hedging derivatives, it is important to understand if firms change the extent to which they use derivatives in response to increased disclosure requirements after the adoption of SFAS 161.

Further, proponents of the standard argue that derivatives disclosures allow investors to evaluate the impact of derivatives on the financial statements, which may provide incentives for more prudent risk management choices. However, theoretical research suggests that mandatory derivatives disclosures may induce firms to take an excessive speculative position with derivatives (Sapra 2002). Examining factors that drive speculation is important as survey evidence indicates that a large number of firms speculate (Geczy, Minton, and Schrand 2007; Bartram, Brown, and Conrad 2011). While the dollar significance and net profits related to speculation are modest (Hentschel and Kothari 2001; Brown, Crabb, and Haushalter 2006), the highly publicized derivatives-related losses suggest that speculation can have a material impact on a firm. Whether or not firms increase or decrease the extent to which they speculate with derivatives due to mandatory hedge disclosures remains an open question (Kanodia and Sapra 2015). My study fills this void in the literature and is the first to provide evidence on the real effects of mandatory derivatives disclosures on derivatives use and speculation with derivatives, in an empirical setting.

Finally, I examine the accounting effects of mandatory derivatives disclosures. Specifically, I analyze whether the accounting designation of derivatives is informative of derivatives economic use and whether mandatory derivatives disclosures affect the designation. The accounting designation of

hedges (cash flow, fair value or net investment hedges). Further, *accounting designation* refers to a firm's choice to designate qualifying derivatives as hedges for accounting purposes.

derivatives is informative if it reflects derivatives' economic use (i.e., whether firms use designated derivatives for hedging purposes and non-designated derivatives for speculation). While the FASB requires hedging derivatives to be effective hedges of a hedge item (e.g., asset or liability), it does not require hedging derivatives to be effective hedges of the firm's overall risk exposure. Take for example a firm with both future revenues and expenses in a foreign currency, but with a net revenue exposure (revenues exceed expenses). The ideal hedging would be to use derivatives to hedge the currency risk associated with the excess revenue. A derivative that hedges a future expense in the foreign currency (e.g., a forecasted purchase of raw materials) may be an effective hedge of the forecasted purchase. However, given that the net exposure of the firm is on the revenue side, hedging a future expense exposes future revenue to currency risk, and the overall position is more speculative than without the use of the derivative. Therefore, this derivative is speculative with respect to the firm's overall exposure, as it increases the net exposure to foreign currency risk.

Further, SFAS 161 may change firms' incentives to designate derivatives because it requires fewer disclosures for non-designated derivatives. Examining whether the accounting designation of derivatives is informative of derivatives' economic use is important as investors may rely on the accounting designation to determine how firms use derivatives, even in the presence of detailed derivatives disclosures. For example, prior research suggests that both investors and analysts struggle to process derivatives related information (Koonce, Lipe, and McAnally 2005; Cambell, Downes, and Schwartz 2015) and that the additional disclosures provided by SFAS 161 do not help analysts improve their forecasts (Chang, Donohoe, and Sougiannis 2016). Whether or not the accounting designation of derivatives is informative of their economic use and how mandatory derivatives disclosures change the conveyed information remain open questions. My study provides evidence on these issues.

SFAS 161, "Disclosures about Derivative Instruments and Hedging Activities", effective for fiscal years beginning after November 15 2008, significantly expands the derivatives and hedging

disclosure requirements imposed by SFAS 133 (FASB 1998), without changing the accounting for derivatives. It requires disclosure of fair values and gains and losses related to derivatives by underlying risk hedged, accounting designation, and income statement or balance sheet line items affected. SFAS 161 does not require disclosures of the notional amounts of derivatives. The adoption of SFAS 161 represents a shock to derivatives and hedging disclosures, and provides a setting to examine the impact of mandatory hedge disclosures on risk management choices.

The adoption of SFAS 161 was contemporaneous with other events that may affect firms' risk management choices. To alleviate concerns that macroeconomic or other factors in the post-SFAS 161 period and not mandatory derivatives disclosures drive my results, I construct a variable (COSTD) that captures the cost imposed by the standard. I classify firms as either high cost (HC) or low cost (LC) based on the magnitude of the change in derivatives disclosures made in response to the adoption of SFAS 161. COSTD takes the value of 1 for firm in the top quartile of the change in disclosure (HC), and 0 otherwise (LC). The idea behind this measure is that the cost of compliance imposed by SFAS 161 is higher for firms that made few *voluntary* disclosures prior to the adoption of SFAS161 and increased *mandatory* derivatives disclosures in response to the standard.

I first assess whether or not firms decrease the extent to which they use derivatives after the adoption of SFAS 161. I measure the extent of derivatives use as the notional amount of derivatives, scaled by lagged total assets. For HC firms, I find a significant reduction in the notional amount of derivatives in the post-SFAS 161 period, as compared to the pre-SFAS 161 period, after controlling for endogeneity and factors that explain derivatives use. In contrast, I find no significant change in the notional amount of derivatives for LC firms. Second, I examine whether firms increase or decrease the extent of speculation in response to mandatory derivatives disclosures. Following prior literature, I measure the extent of speculation as the residual from annual cross-sectional regressions of the notional amount of derivatives on firm fundamentals (Brown et al. 2006; Beber and Fabbri 2012). I

test whether the differences in the mean and median of speculation between the pre- and post-SFAS 161 periods are significant. In a univariate analysis, I find that the extent of speculation decreased significantly in the post-SFAS 161 period for HC firms but, not for LC firms.

Third, I examine whether or not the accounting designation of derivatives is informative of derivatives economic use and if this relation changes after the adoption of SFAS 161. I find that the accounting designation of derivatives is informative of their economic use, as designated derivatives are associated with hedging incentives and are effective hedges of firms' overall exposure, while non-designated derivatives are not. This suggests that firms are more likely to use designated than non-designated derivatives to hedge firm's overall risk exposure.

Finally, I find that both HC and LC firms reduce the extent of designated derivatives used and increase the extent of non-designated derivatives used after the adoption of SFAS 161. At the same time, the hedge effectiveness of designated derivatives decreases following the standard's adoption, indicating that firms designate fewer hedging derivatives as accounting hedges. Further, I find that firms increase the extent of non-designated derivatives while reducing speculation. Taken together, these findings suggest that the accounting designation of derivatives is less informative of derivatives economic use after the adoption of SFAS 161.

With this study, I contribute to three streams in the accounting and finance literature. First, I contribute to the literature that investigates the economic consequences of derivatives use and derivatives regulation. Prior empirical studies examine the impact of SFAS 133 on the extent of derivatives use and firm risk (Singh 2004; Zhang 2009; Papa 2010; Lins, Servaes, and Tamayo 2011; Chen, Tan, and Wang 2013) and the impact of SFAS 161 disclosures on entry decisions (Zou 2013). Theoretical studies also examine the effect of mandatory derivatives and hedge disclosures on derivatives use (DeMarzo and Duffie 1995; Sapra 2002; Hoang and Ruckes 2013). I add to this literature by providing first empirical evidence of the effect of mandatory derivatives disclosures on

the extent of derivatives use, the extent of speculation with derivatives, and the informativeness of the accounting designation of derivatives.

Second, my study contributes to the growing literature that examines the hedge effectiveness and accounting designation of derivatives. An extensive body of empirical studies investigate firm characteristics that theory suggests are associated with firms' use of hedging (see Aretz and Bartram 2010 for a review of the literature) and speculative derivatives (Brown et al. 2006; Adam, Fernando, and Salas 2008; Beber and Fabbri 2012). Zhang (2009) develops a measure of hedge effectiveness using the change in risk exposure after the initiation of a derivatives program. I add to this literature by showing that the accounting designation of derivatives is related to their economic use. I find that designated derivatives are related to hedging incentives and are effective hedges of firms' overall exposure, while non-designated derivatives are not. This implies that firms are more likely to use designated derivatives than non-designated derivatives for hedging purposes. I also contribute to the literature by developing a new method to determine hedge effectiveness, as the extent to which derivatives gains and losses offset gains and losses before taxes and derivatives. Compared to the classification developed by Zhang (2009), this method can be utilized for derivatives users as well as new users and it measures derivatives hedge effectiveness directly.

Third, my study also contributes to the existing literature on the real effects of mandatory disclosures. While numerous studies examine the price effects of new disclosure requirements, few studies examine the real effects of these disclosures. This gap in the literature led Leuz and Wysocki (2008) and Kanodia and Sapra (2015) to call for more research on the real outcomes of disclosure regulation. To date, a few studies examine the real effects of mandatory non-financial information. For example, Jin and Leslie (2003) find that a mandatory increase in the product quality information disclosed to consumers has real effects on firms' choices of product quality. Further, Christensen, Floyd, Liu, and Maffett (2016) show that firms' dissemination of non-financial information through

financial reports has real effects, even if the content of the disclosure is already publicly available. My study adds to this literature by providing evidence of real effects of mandatory financial disclosures.

Finally, my study is informative to standard setters, as the FASB is currently considering additional derivatives and hedge disclosures (FASB 2015). Overall, my results suggest that firms' response to mandatory derivatives disclosures is mixed. On the one hand, SFAS 161 is associated with more prudent risk management, as firms decrease the extent to which they speculate with derivatives. On the other hand, firms reduce the extent of overall derivatives use, which may lower the benefits associated with hedging derivatives. Further, the accounting designation of derivatives may be less informative to investors after the adoption of SFAS 161, as the accounting designation is less related to their economic use.

Section 2 provides background information on derivatives accounting and reporting and prior academic research, and Section 3 develops my hypotheses. Sample selection and research design are described in Sections 4 and 5. Section 6 reports the main results and Section 7 concludes.

2. BACKGROUND

Derivatives accounting and reporting

Derivatives are important and effective tools for risk management (SEC 1997). The last two decades have witnessed a spectacular growth of 1,200% in derivatives use, a growth unmatched by any other economic activity (Abdel-Khalik and Chen 2015). Over the past 30 years, the FASB has issued a series of standards providing accounting and disclosure guidance for derivatives. Initially, SFAS 52 (FASB 1981) and SFAS 80 (FASB 1984) established derivatives accounting rules and SFAS 105 (FASB 1990), SFAS 107 (FASB 1991), and SFAS 119 (FASB 1994) provided disclosure guidance. However, the accounting treatment and required disclosures prescribed by these standards were incomplete and inconsistent, depending on the type of financial instrument used or management's intent for using derivatives. The fair values of non-hedging derivatives were recorded on the balance sheet, while the unrealized gains and losses were reported in the income statement. However, hedging derivatives were recognized in the same manner as the hedged item, which often was historical cost. Since most non-financial firms claim to use hedging derivatives, and the historical cost of derivatives is often zero or negligible, many derivatives were off-balance-sheet (FASB 1998).

To address these concerns, the FASB issued SFAS 133 (FASB 1998) and SFAS 138 (FASB 2000), both effective June 2000. These standards define derivatives and require firms to recognize derivatives as assets and liabilities on the balance sheet at fair value. Fair value recognition of derivatives increases income volatility as gains and losses on derivatives are included in earnings. Hedge accounting, permitted under SFAS 133, reduces income volatility for qualifying derivatives in hedging relations by allowing firms to recognize gains and losses on derivatives in the same period as the gains and losses on the hedged item. Under SFAS 133, derivatives may be designated as: (i) hedges of the exposure to variable cash flows of an asset or liability or a forecasted transaction (cash flow hedge); (ii) hedges of the exposure to changes in the fair value of a recognized asset or liability or a

firm commitment (fair value hedge); or (iii) hedges of the foreign currency exposure of a net investment in a foreign operation (net investment hedge). The adoption of SFAS 133 led to some implementation issues that were later addressed in SFAS 149 (FASB 2003) and SFAS 155 (FASB 2006).

SFAS 133 requires firms to disclose (i) net gains/losses recognized in earnings representing hedge ineffectiveness and amounts excluded from the assessment of hedge effectiveness (fair value and cash flow hedges); (ii) gains/losses recognized in earnings when a hedged firm commitment no longer qualifies as a fair value hedge; (iii) estimates of amounts to be reclassified from OCI into earnings in the next 12 months (cash flow hedges); (iv) amounts reclassified into earnings as a result of discontinued cash flow hedges; and (v) gains or losses included in cumulative translation adjustment during the reporting period (net investment hedges). However, the standard has been criticized for not requiring enough information to allow users to assess the impact of derivatives and hedging activities on firms' financial statements (FASB 2008).

In response to these concerns, the FASB issued SFAS 161: "Disclosures about Derivative Instruments and Hedging Activities," effective for fiscal years beginning after November 15, 2008. SFAS 161 requires enhanced derivatives disclosures, without changing the accounting for derivatives. It requires disclosures of fair values and gains and losses in a tabular format. Further, entities are required to disaggregate fair values and gains and losses by underlying risk (foreign exchange, interest rate, commodity price, equity price, and credit risk), accounting designation (derivatives designated as cash flow, fair value, net investment hedges, or non-designated derivatives), and income statement and balance sheet line items affected. The statement aims to improve transparency in financial reporting by providing information on how and why an entity uses derivatives, how derivatives are accounted for under SFAS 133, and how derivatives and hedging activities affect an entity's financial position, financial performance, and cash flows. Moreover, in a recent Board Meeting, the FASB

tentatively decided to further amend hedge accounting disclosures and plans to develop a staff draft of the proposed Accounting Standards Update to amend Topic 815 (FASB 2015).

Hedging versus speculation

Hedging with derivatives reduces both the exposure to changes in the fair value of assets, liabilities and firm commitments and the exposure to the variability in cash flows of assets, liabilities and forecasted transactions (FASB 1998). Designated derivatives are by definition highly effective hedges of a specific item, like an asset, liability, or a forecasted transaction. However, with respect to the firm's overall net exposure, designated derivatives may even be speculative (Ryan 2011). Speculation is "the attempt to profit from anticipating movements in market rates and prices" (GAO 1994) and "implies that the derivative position is undertaken with the primary intention of making profit or increasing risk" (Geczy et al. 2007). This practice is referred to in the literature as selective hedging or "taking a view." Managers may hedge selectively by adjusting the extent to which they hedge an existing exposure (over- or underhedge) based on their views of future price movements. To evaluate firms' hedging and speculative activities, investors need derivatives and hedge disclosures.

Literature review

My study is related to the literature on the economic consequences of derivatives use and derivatives regulation. Prior studies examine whether the adoption of SFAS 133 led to a decrease in the extent of derivatives use. Lins et al. (2011) and Chen et al. (2013), in a survey and an experiment, respectively, find that managers use fewer derivatives when the derivatives are measured at fair value instead of historical cost. In contrast, Papa (2010) fails to find a decrease in derivatives use after the adoption of SFAS 133. Another line of research investigates the informativeness of derivatives disclosures and the impact of accounting regulation. In an experiment, Koonce et al. (2005) find that investors struggle to understand the information provided by derivatives. Further, Chang et al. (2016) find that while analysts routinely misjudge the earnings implications of derivatives use, a series of

derivatives accounting standards help improve analysts' forecasts over time. However, they find that the additional disclosures provided after SFAS 161 do not improve analysts' forecasts. On the other hand, Zou (2013) finds that unrealized gain/losses on derivatives in cash flow hedges are more informative to potential entrants after the implementation of SFAS 161, suggesting that the additional disclosures mandated by SFAS 161 provide useful information to the market.

Two theoretical studies explore the effect of mandatory hedge disclosures on derivatives. Sapra (2002) finds that disclosures of derivatives positions have an indirect effect on firm value because the hedging and production decisions are based on managers' private information about the spot market. Surprisingly, the results suggest that under mandatory hedge disclosures, the firm, rather than being more prudent in its risk management, actually increases its speculative positions as managers have incentives to take derivatives positions that imply a high private signal. Hoang and Ruckes (2013) examine the impact of mandatory hedge disclosures on the extent of derivatives use and find that mandatory hedge disclosures may result in a decrease in hedging derivatives as managers try to protect firms' private information and raise entry barriers. My study adds to this literature by providing the first empirical evidence of the effect of SFAS 161 on the extent of overall derivatives use, speculation with derivatives, and the extent to which the accounting designation of derivatives reflects their economic use.

My study also adds to the growing literature on the economic use and accounting designation of derivatives. A few studies calculate the portion of derivatives use that is attributable to speculation and examine the firm characteristics associated with speculation. Brown et al. (2006) find that few firm characteristics are associated with speculation. They find a significant relation between speculation and growth opportunities, but no association with firm size, the probability of bankruptcy, financial flexibility, or ownership structure. Further, while there is considerable evidence of selective hedging, the economic gains to selective hedging are small (Adam and Fernando 2006; Brown et al. 2006). Two

studies classify firms directly as either hedgers or speculators based on changes in risk exposure and on derivatives accounting designation. Zhang (2009) develops a measure of hedge effectiveness based on changes in risk exposure after the initiation of a derivatives program. She classifies firms as effective hedgers if risk exposure decreases after the initiation of a derivatives program, and speculators otherwise. However, this measure can only be used to classify new users (not all derivatives users) as speculators or hedgers. Furthermore, the measure is not specific to derivatives use. For example, if derivatives initiation is part of a new risk management program, this classification picks up the effectiveness of the overall risk management program, not that of the derivatives program.

Further, Manchiraju, Pierce, and Sridharan (2014) examine how the accounting designation of derivatives relates to firm risk. The authors find that the use of derivatives designated as cash flow hedges is associated with lower firm risk, while the use of non-designated derivatives is associated with higher firm risk. However, in the cross-section, it is hard to interpret the association between derivatives use and firm risk (Guay 1999). I add to this literature by developing a method to determine hedge effectiveness that can be used to classify both new users and users of derivatives as hedgers or speculators and can measure derivatives hedge effectiveness directly. I further add to the literature by examining whether the accounting designation of derivatives relates to hedging and speculative incentives and by separately examining the hedge effectiveness of designated and non-designated derivatives.

Finally, my study is related to the literature that investigates the real effects of mandatory disclosures. Engel, Hayes, and Wang (2007) analyze firms' going private decisions around SOX, while Gao, Wu, and Zimmerman (2007) provide evidence that SOX size-based exemptions provide incentives for firms to remain small and have real effects on investment. However, as SOX prescribes both corporate practices and mandatory disclosures, it is hard to separate the impact of mandatory disclosures on managers' real actions. A few studies investigate the impact of non-financial mandatory

disclosures on firm's real activities. For example, Jin and Leslie (2003) find that a mandatory increase in the product quality information disclosed to consumers has real effects on firms' choices of product quality. Further, Christensen et al. (2016) show that firms' dissemination of non-financial information through financial reports has real effects, even if the content of the disclosure is already publicly available. Specifically, they find that mandatory non-financial disclosures of mine safety records has real effects on mining-related citations and injuries, as well as labor productivity in a sample of mines owned by SEC-registered issuers. My study adds to this literature by investigating the impact of mandatory financial disclosures on firms' real decisions regarding the extent of derivatives use and speculation with derivatives.

3. HYPOTHESIS DEVELOPMENT

Managers have proprietary information about the future performance and activities of the company and they use this proprietary information when making hedging decisions. Disclosures related to derivatives used in cash flow hedges of a forecasted transaction (whether or not designated as a hedging derivative) may provide information about forecasted, but unrecorded, sales, purchases or debt issuances. For example, a manufacturing firm that plans to increase production in the next period may enter into cash flow hedges of forecasted purchases of raw materials. The disclosures related to the derivatives and the hedged item provide information about future production.

In addition, managers may have proprietary information regarding future market prices and may use that information to adjust their hedging portfolios. In a survey of gold producers, managers cited long-term and near-term market views on gold prices as the two most important factors in deciding the extent to which they hedge (Brown et al. 2006). Brown et al. (2006) further find that the gold producers in their sample are successful in changing hedge ratios in the profitable direction, suggesting they also have a comparative advantage in predicting future prices.

SFAS 161, effective as of November 2008, requires firms to report gains and losses and fair values of derivatives by derivative type, accounting designation, and income statement and balance sheet line item affected. It also requires disclosures of the amount of gains and losses on derivatives designated as cash flow and net investment hedges included in other comprehensive income (OCI) or reclassified from OCI to earnings. (Appendix B summarizes disclosure requirements under SFAS 161). Critics of mandatory derivatives disclosures are concerned that the detailed derivatives and hedging disclosures may reveal managers' private information. In a testimony to the Senate Banking, Housing and Urban Affairs Committee, Hershey's CEO stated that disclosing gains and losses on cocoa derivatives contracts would reveal key information to their principal competitors in the confectionery industry; and may lead to a loss in market share (Wolfe 1997). For example, if Hershey has to disclose

a loss on cocoa derivatives, competitors would know that Hershey's cocoa cost is higher, and could use this information in their pricing and promotions decisions to gain an advantage. In a comment letter to the ED of SFAS 161, Edison Electric Institute likewise expressed concern with disclosing proprietary information about forecasted purchases of oil when the forecasted purchase is hedged. If derivatives disclosures contain proprietary information, competitors may use them to make inferences about firms' future performance.

One way that managers can protect their proprietary information in a mandatory disclosure regime is to reduce or completely eliminate the extent of derivatives use (DeMarzo and Duffie 1995; Hoang and Ruckes 2013). Indeed, Hershey's CEO stated that in the face of increased derivatives disclosures, Hershey was considering other risk management tools (Wolfe 1997). Other executives made similar claims. For example, in a survey of 319 financial executives by the Treasury Management Association, 41.7% of respondents indicated that the additional derivatives disclosures proposed by the SEC would discourage derivatives use to a moderate extent or greater. Therefore, the adoption of SFAS 161 may result in a reduction in derivatives use. Further, I expect the change in derivatives use in the post-SFAS 161 period to be significantly greater for HC firms relative to LC firms. The above discussion leads to the following hypotheses:

H1a: The adoption of SFAS 161 is associated with a decrease in overall derivatives use.

H1b: The adoption of SFAS 161 is associated with a greater decrease in overall derivatives use for HC firms relative to LC firms.

Furthermore, the adoption of SFAS 161 may create incentives for speculation. Sapra (2002) analytically shows that mandatory hedge disclosures may deter prudent risk management and induce managers to take excessive speculative positions in order to influence investors' perception of the firm's private information. The intuition behind this finding is as follows. First, managers may acquire specialized information through their normal operating activities and use this information to take a

view in the market using derivatives. Prior research shows that managers frequently take derivatives positions based on their views of future price movements (Bodnar, Hayt, and Marston 1995; Brown et al. 2006; Beber and Fabbri 2012).

Second, derivatives and hedging disclosures, then, indirectly affect firm value by revealing this proprietary information. For example, on the same day that gold producer Placer Dome, announced a decrease in hedging activities, gold prices increased by 10% and the firm's share prices increased by 24% (Heinzl 2000). Gold prices decreased a few days later when Barrick, another gold producer, did not decrease hedging activities to the extent expected by the market (Whitman 2000). Anecdotal evidence suggests that managers are concerned with disclosing information about their market views through derivatives disclosures. For example, Hershey's CEO indicated that market participants could use information about the firm's cocoa derivatives position to determine both the extent to which their cocoa needs are hedged and Hershey's view of the market price direction (Wolfe 1997). Further, in comment letters to the exposure draft of SFAS 161, a number of respondents expressed concern about the proprietary or competitive costs of these disclosures.

Third, investors' response depends upon managers' disclosures and actions, not upon managers' private information. If outsiders use derivatives disclosures to make inferences about managers' proprietary information, managers can strategically use derivatives to influence outsiders' perception of firm value. For example, managers concerned about the value of the firm have incentives to convey that they have good news about the firm. If derivatives positions are observable, one way to credibly convey that managers have good news is to take a derivatives position consistent with this message. In this case, a gold producer may strategically decrease hedging activities to signal some private information about an increase in future gold price. These derivatives positions are speculative and should increase firm risk (Guay 1999). Therefore, the real effects of mandatory disclosures here

come from the interaction of what the managers know and what the market infers from derivatives disclosures (Kanodia and Sapra 2015).

However, increased derivatives and hedging disclosures allow investors to evaluate firms' risk management program using derivatives and the impact of derivatives on financial statements, which may provide incentives for managers to engage in more prudent risk management practices. Further, these incentives to increase speculation or for more prudent risk management practices should be higher for HC firms, as these firms have to increase disclosures to a greater extent in response to the adoption of SFAS 161. Because the effect of SFAS 161 on speculation is not clear ex ante, I formulate the following hypotheses in the null form:

H2a: The adoption of SFAS 161 is not associated with a change in the extent of speculative derivatives.

H2b: The adoption of SFAS 161 is not associated with a change in the extent of speculative derivatives in a sample of HC firms.

SFAS 161 requires additional disclosures regarding derivatives designated as accounting hedges relative to non-designated derivatives. For example, in regards to designated derivatives, firms have to disclose the amount of hedge ineffectiveness, the amount excluded from the assessment of hedge effectiveness, the fair value of the related hedged items (fair value hedges), the existence of credit-risk-related contingent features in derivatives, and the aggregate fair value of assets that are posted as collateral. These additional disclosures may reveal proprietary information. Therefore, if managers are concerned with disclosing information pertaining to future firm performance or activities, they may decrease (increase) the extent of designated (non-designated) derivatives. Further, this effect may be stronger for firms with a higher cost of disclosure.

H3a: The adoption of SFAS 161 is associated with a decrease (increase) in derivatives designated (not designated) as hedges for accounting purposes.

H3b: The decrease (increase) in derivatives designated (not designated) as hedges for accounting purposes following the adoption of SFAS 161 is greater for HC firms relative to LC firms.

Finally, I examine whether designated and non-designated derivatives are effective hedges with respect to the overall firm exposure and whether their hedge effectiveness changes after the adoption of SFAS 161. This test complements H2 and H3 and provides further insight into the impact of SFAS 161 on the informativeness of derivatives accounting designation. Hedge effectiveness measures the extent to which derivatives-related gains and losses offset changes in fair value or cash flows attributable to the hedged item (FASB 1998). While all designated derivatives are highly effective hedges of the hedged item, they may not be effective hedges with respect to the firm's overall exposure to a specific risk.

Consider the earlier example of the firm with both future revenues and expenses in a foreign currency, but with a net revenue exposure to the currency. The firm may enter into a derivative position that is a highly effective hedge of an expense in the foreign currency (e.g., a future purchase of raw materials) and designate the derivative as a hedge for accounting purposes. However, because the net exposure of the firm is on the revenue side, this derivative would be speculative with respect to the overall risk exposure. Similarly, the firm may enter into a derivative that is a highly effective hedge of a forecasted sale in the foreign currency. While this derivative is a highly effective hedge of the hedged item, and a hedge with respect to the overall exposure, the firm may choose not to designate it as an accounting hedge. Therefore, both designated and non-designated derivatives may be effective hedges of a hedged item, effective hedges of the firm's net exposure, or speculative with respect to the overall exposure to the risk being hedged. If firms are more likely to use designated than non-designated derivatives for hedging purposes, hedge effectiveness will be higher for designated derivatives. If the accounting designation of derivatives is not informative of derivatives economic

use, there will not be a significant difference in the hedge effectiveness of designated and non-designated derivatives.

H4a: There is no difference in the hedge effectiveness of designated and non-designated derivatives.

Further, the adoption of SFAS 161 may result in lower hedge effectiveness for both designated and non-designated derivatives if firms are more likely to use speculative derivatives in these categories. In a similar manner, hedge effectiveness of designated and non-designated derivatives will increase if firms use more hedging derivatives in these categories. The above discussion leads to the final hypothesis:

H4b: The hedge effectiveness of designated and non-designated derivatives does not change following the adoption of SFAS 161.

4. DATA AND SAMPLE SELECTION

For this study, I build an unbalanced panel data set using hand-collected derivatives and hedging data from 10-K reports. I begin with firms in the Compustat database in the fiscal-year 2001 and exclude (i) financial and regulated firms and (ii) firms with missing data to calculate market capitalization. Following prior literature, I exclude financial and regulated firms as their financial reporting is different form non-financial companies (Fauver and Naranjo 2010; Donohoe 2015) and financial firms are often traders of derivatives rather than end-users. Given the high cost of hand-collecting data, I restrict my sample to 1,000 non-financial firms with the largest market capitalization as of 2001, because prior research suggests that larger firms are more likely to use derivatives. I then focus on a 13-year period starting in fiscal year 2001, after the adoption of SFAS 133. Because SFAS 133 changed both reporting and disclosure requirements for derivatives and hedging activities, collecting data after its adoption ensures homogenous reporting requirements for the entire period.

My initial sample consists of 1,000 firms and 10,201 firm-year observations. I drop observations with data not available in Compustat (674), non-user observations (3,053), firms that initiated derivatives after the adoption of SFAS 161 (90), and firms that stopped using derivatives before the adoption of SFAS 161 (905). As the purpose of my study is to examine the effect of mandatory derivatives disclosures on derivatives users, I focus on firms that use derivatives prior to the adoption of SFAS 161 and continue to use derivatives after the adoption of the standard. My final sample consists of 496 firms (5,479 firm-year observations) that use derivatives both before and after the adoption of SFAS 161. Out of this final sample, I use a subsample of 3,012 observations that disclose the notional amount of derivatives and the prior period notional amount of derivative to examine the impact of SFAS 161 on the extent of derivatives use and the extent of speculation with derivatives. Further, I use a subsample of 1,939 observations that disclose the notional amount of derivatives disaggregated by accounting designation to investigate the impact of SFAS 161 on the

accounting designation of derivatives. Finally, to examine hedge effectiveness by accounting designation, I use a subsample of 2,090 observations that disclose the gains and losses on derivatives disaggregated by accounting designation.

I hand-collect derivatives data related to the extent of derivatives use and derivatives and hedging disclosures. The extent of derivatives use can be measured by: the notional amount of derivatives outstanding at end of the period; the total fair value of derivatives contracts at the end of the period, and the gains and losses on derivatives positions during the year. In my study, I use the notional amount of derivatives as a proxy for derivatives use for the following reasons. First, using the notional amount as a proxy for derivatives use provides greater comparability to prior studies, as it is the most frequently used measure in the literature due to its availability (i.e., Guay 1999; Abdel-Khalik and Chen 2015; Donohoe 2015). Second, most firms present the notional amount on a gross basis, while the total fair value of derivatives represents the net amount of derivatives assets and liabilities, which may understate the extent of derivatives use. Third, disclosure regulation regarding notional amounts has not changed over the period analyzed.

Table 1 reports descriptive statistics for the derivatives data. Panel A presents the temporal distribution of the user data by type of risk hedged. Consistent with prior studies, foreign exchange derivatives are the most common class of derivatives (75.52%), followed by interest rate derivatives (54.04%), and commodity price derivatives (24.49%) (Bodnar et al. 1996; Nguyen and Faff 2002; Bartram et al. 2011; Lins et al. 2011). Other studies find that firms use interest rate derivatives to an equal or greater extent than foreign exchange derivatives (Bodnar, Hayt, and Marston 1998; Guay 1999; Donohoe 2015). Panel B reports the number of firms that disclose the notional amount of derivatives by fiscal year. On average, 62.31% chose to disclose the notional amount voluntarily, and the proportion of firms disclosing the notional amount does not change significantly during the period under study.

Table 1 Panels C and D illustrate the number of firms that disclose derivatives gains and losses reported in the income statement and OCI, respectively. I document a widespread variation in derivatives and hedging disclosures by firms. The number of firms disclosing derivatives gains and losses increases after 2008. For example, while 82.44% of firms disclose derivatives gains and losses in the income statement in fiscal 2009, only 26.76% do so voluntarily in fiscal 2007. These changes are explained by the adoption of SFAS 161 in fiscal years 2009 and 2010, and by an early response to the proposed regulation in 2008.

I observe that after the adoption of SFAS 161, some firms chose to make fewer disclosures than appear to be mandated by the standard. This is consistent with prior studies that investigate mandatory disclosures both in a derivatives (Bhamornsiri and Schroender 2004; Zou 2013) and a non-derivatives context (Ellies, Fee, and Thomas 2012). This noncompliance may be explained by the high costs of derivatives disclosures or by the non-materiality of hedging activities. First, if firms consider the cost of disclosure to be higher than the cost of noncompliance, they may choose to not comply fully with the requirements of SFAS 161. Second, SFAS 161 requires firms to disclose derivatives related information if hedging activities are material. If firms do not consider their derivatives use material, they may not provide all disclosures required by the standard.

To measure the cost of disclosure imposed by SFAS 161, I construct a disclosure score from data hand-collected from annual reports. I examine the effect of mandatory derivatives disclosures as required by SFAS 161 on the extent of derivatives use, speculation, and the informativeness of the accounting designation of derivatives. Therefore, the items selected for inclusion in the score are based on SFAS 161 disclosures of derivatives gains and losses. I choose to focus on disclosures of gains and losses, and not on total derivatives disclosures, as prior research and anecdotal evidence suggest that derivatives gains and losses contain proprietary information and are associated with a high cost of disclosure (Wolfe 1997; Zou 2013). The finding that only a few firms chose to disclose gains and losses

voluntarily (compared to the number of firms that disclosed notional amounts and fair values voluntarily) prior to the adoption of the standard provides further evidence of the potential costs associated with these disclosures.

Self-constructed disclosure scores have been extensively used in prior studies (Aggarwal and Simkins 2004; Chalmers and Godfrey 2004; Papa 2010). Following prior literature, I code the disclosures on a categorical basis and assign a value of one if the relevant disclosure is present, and zero if applicable, but not disclosed (Chalmers and Godfrey 2004). The measure takes values from zero to six, where zero represents no disclosure about the impact of derivatives on the income statement and OCI, and six represents disclosures about these items disaggregated on multiple levels, as required by SFAS 161. I allocate four of the six points to income statement disclosures: one point if total derivatives gains and losses are disclosed, and one point for each level of disaggregation (if gains and losses are presented by type of risk hedged, by accounting designation, and by income statement line item affected). I also allocate one point if firms disclose the impact of derivatives on OCI, and one point if that impact is disaggregated between the change in fair value of derivatives deferred in OCI and amount transferred from OCI to income. The total disclosure score is the sum of the relevant disclosures made (see Appendix C for more details).

Table 1 Panel E reports descriptive statistics for the disclosure score. As expected, the mean disclosure score increases with the adoption of SFAS 161 from 1.507 in 2007 to 4.348 in 2009. The largest changes in the disclosure score occur in 2009 (2.942) and 2010 (2.438), the fiscal years SFAS 161 was adopted. Table 1 Panel F reports the industry distribution of the sample. Manufacturing and business equipment comprise more than one third of my sample. On the other hand, consumer durables, manufacturing, and chemicals and allied products have the largest percentage of firms with a high cost of disclosure. Overall, 24.16% of firms have a high cost of disclosure.

Table 2 presents the mean notional amount of total derivatives, and the mean notional amounts of designated and non-designated derivatives as a percentage of lagged total assets, by fiscal year. The mean notional amount of derivatives, as a percentage of lagged total assets is 14.20%. This ratio is slightly higher than the one reported in prior studies (Hentschel and Kothari 2001; Graham and Rogers 2002; Borokhovich, Brunarski, Crutchley, and Smkins 2004; Clark and Mefteh 2010) for two possible reasons. First, my sample consists of large firms, and larger firms are both more likely to use derivatives and to use them to a greater extent. Second, my sample is more recent, and the notional amount of derivatives has been increasing over time. The notional amount of designated derivatives is higher than the notional amount of non-designated derivatives in all fiscal years presented. Consistent with my predictions, the notional amount of derivatives and the notional amount of designated derivatives are statistically lower in fiscal year 2009 than in fiscal year 2007 (p-value 0.053 and 0.004, respectively). The notional amount of non-designated derivatives is statistically higher in fiscal year 2009 than in fiscal year 2007 (p-value 0.019).

Panels A and B of Figure 1 present the speculative (SPECULATE) and hedging (HEDGE) components of the notional amount of derivatives over time. The plot reveals an initial increase in the extent of speculation and a decrease after the adoption of SFAS 161. Both the increase in speculation and the subsequent decrease are more pronounced for HC firms. Further, HEDGE increases over time and decreases slightly with the adoption of SFAS 161 for both HC and LC firms.

5. RESEARCH DESIGN

I first examine whether the adoption of SFAS 161 affects the extent of derivatives use. In this context, there are two potential sources of sample selection bias: from the decision to use derivatives and the decision to disclose the notional amount of derivatives. Sample selection bias arises when the researcher does not observe a random sample of the population of interest. In my study, the population of interest is the population of derivatives users; therefore, sample selection bias arising from the decision to use derivatives is not a major concern. However, selectivity bias from the firm's decision to voluntarily disclose the notional amount of derivatives is not random and is a concern in this study. Between 2001 and 2013, firms were not required to disclose the notional amount of derivatives, but a large proportion did so voluntarily (62%). Observable and unobservable determinants of the decision to disclose the notional amount of derivatives may affect the relation between the extent of derivatives use and the adoption of mandatory hedge disclosure rules. If the sample selection bias is ignored, the coefficients in the second-stage model will be biased. I use Heckman's (1979) two-step procedure to control for these factors as it is the standard approach to correct for selection bias when the choice variable is binary (Tucker 2011; Lennox, Francis, and Wang 2012).

I start by estimating the first stage model, which predicts the decision to disclose the notional amount of derivatives. Prior empirical literature identifies key incentives that influence the decision to disclose derivatives-related information (Aggarwal and Simkins 2004; Chalmers and Godfrey 2004; Papa 2010). This decision is a factor of capital markets and proprietary costs incentives, managerial risk incentives, size, firm performance, and ownership structure. Therefore, I model a firm's decision to disclose the notional amount of derivatives with the following probit model:

$$NOTIONAL\_DISCL = \sim_1 + \sim_2 MKT\_SHARE + \sim_3 HHI + \sim_4 ECSENS + \sim_5 CP\_USER + \sim_6 INSTOWN + \sim_7 SIZE + \sim_8 ROA + \sim_9 BIGN + \sim_{10} SFAS\_161 + \sim_{11} COSTD + \sim_{12} GDP\_GROWTH + \sim_{13} FI + \sim_{14} FRISK + \sim_{15} IRISK + \sim_{16} CRISK + \sim_{17} MA + \sum_x \sim_x RMI_{it}^x + \sum_K \sim_K IND + \pounds(1),$$

where the dependent variable, NOTIONAL_DISCL, is 1 when the dollar amount of the total notional amount of derivatives is disclosed, and 0 otherwise[2]. Prior research and anecdotal evidence suggest that derivatives disclosures may contain proprietary information. Therefore, I include market share (MKT_SHARE) as a proxy for proprietary costs and expect a negative association with derivatives disclosures. I also include the Herfindahl index (HHI) to control for industry competition and expect a negative relation between the competitiveness of the industry and disclosure. Since managers' career concerns may influence the disclosure choice (DeMarzo and Duffie 1995; Papa 2010), I also include ECSENS, a measure of the sensitivity of executive compensation to firm value (Donohoe 2015), and predict a negative association with disclosure. Firms using commodity price derivatives are more likely to disclose the notional amount in units other than dollars, like BTUs or bushels. Therefore, I expect a negative relation between users of commodity price derivatives (CP_USER) and disclosures of the notional amount of derivatives.

Because the corporate governance structure can influence the level and quality of disclosure, I include institutional ownership (INSTOWN) in the model (Chalmers and Godfrey 2004; Papa 2010). I also include SIZE, ROA, and a dummy that identifies firms audited by the Big 4 (BIGN) as control variables, as prior research finds that they influence derivatives disclosures (Chalmers and Godfrey 2004; Papa 2010)[3]. Finally, I include all explanatory variables from the second stage model. I use the coefficients from Eq. (1) to construct an Inverse Mills ratio (IMR) that I include as a control variable

[2] Some firms disclose the notional amount of derivatives in something other than dollars, a foreign currency for foreign exchange derivatives or bushels for commodity price derivatives. In this case the dependent variable is coded as 0.

[3] Prior studies also include leverage, litigation risk and the market-to book ratio as explanatory variables for the decision to disclose derivatives-related information. When I include these variable, the coefficients are not significant and do not contribute significantly to the explanatory power of the model. To keep the model parsimonious, I exclude these variables from the analysis.

in Eq. (2) and Eq. (3), shown below. IMR is a bias correction term that controls for the effect of observable and unobservable factors that influence the decision to disclose the notional amount of derivatives on the relation between the extent of derivatives use and mandatory disclosure rules.

Lennox et al. (2012) argue that a convincing implementation of the Heckman's procedure requires the identification of an exogenous independent variable in the first stage model that can be excluded from the second stage model. The exclusion variable in my model is CP_USER, an indicator variable coded 1 for firms that use commodity price derivatives, and 0 otherwise. CP_USER is a good candidate for an exclusion variable as it is an important determinant of the decision to disclose in the first stage model, and it is not related to the extent of derivatives use in the second stage model, after I control for the number of risks hedged. While it is possible to estimate selection models with no exclusion restrictions, imposing exclusion restrictions is preferable because the selection model is less likely to suffer from multicollinearity problems (Lennox et al. 2012). Estimated coefficients from the second stage model yields similar coefficients to the coefficients from the main model Eq. (2) below, where IMR is excluded.

To examine the association between the adoption of SFAS 161 and the extent of derivatives use, I follow prior literature (Gay and Nam 1998; Barton 2001; Beber and Fabbri 2012, among others) and estimate the following OLS regression (variable definitions provided in Appendix A)[4]:

$$NOTIONAL = \sim_1 + \sim_2 SFAS\_161 + \sim_3 COSTD + \sim_4 COSTD * SFAS\_161 + \sim_5 CH\_USER + \sim_6 LAG\_NOTIONAL + \sim_7 FRISK + \sim_8 IRISK + \sim_9 CRISK + \sim_{10} IMR + \sim_{11} GDP\_GROWTH + \sum_x \sim_x RMI_{it}^x + \sum_y \sim_y DIS_{it}^y + \sum_z \sim_z CTRL_{it}^z + £(2),$$

where NOTIONAL is the notional amount of derivatives scaled by lagged total assets, and SFAS_161 is an indicator variable equal to 1 for fiscal years beginning after November 15 2008, the effective date

[4] I also estimate the model using a Tobit regression on a pooled sample of 3,012 users and 2,598 non-users of derivatives, with similar results. NOTIONAL is left-censored as it has a value of zero for non-users of derivatives.

for SFAS 161. COSTD is an indicator variable equal to 1 for firms with a high cost of disclosure, and zero otherwise. I expect both LC and HC firms to reduce the extent of derivatives use after the adoption of SFAS 161 (H1a). Therefore I predict $\sim_2$ will be negative and significant. Because the effect of the cost of disclosure on the notional amount of derivatives prior to the adoption of SFAS 161 is not evident, I make no prediction for $\sim_3$. Furthermore, $\sim_4$ captures the change in derivatives use for HC firms, relative to LC firms, after the adoption of SFAS 161. Consistent with H1b, the coefficient $\sim_4$ should be negative and significant.

Since firms may enter into derivatives for periods longer than a year, the notional amount of derivatives, may also reflect derivatives that were entered into previously. Therefore, I include the lag value of the notional amount of derivatives (LAG_NOTIONAL) to control for the level of derivatives in the prior period and predict a positive association with derivatives use in the current period. Firms use derivatives to manage foreign exchange, interest rate, commodity price, and equity price risk, and a change in the number of risks hedged (CH_USER) should be positively associated with the notional amount of derivatives. I also include GDP growth (GDP_GROWTH) to control for the influence of macroeconomic conditions.

RMI is a vector of risk management incentives that are related to derivatives use. Theory predicts that firms use derivatives to reduce financial distress and bankruptcy costs (Mayers and Smith 1982), agency conflicts of debt and equity (DeMarzo and Duffie 1995; Fok et al. 1997), taxes (Stulz 1996), and information asymmetry. Following Chang et al. (2016), I control for these incentives with variables that capture the likelihood of financial distress (ALTZ), the likelihood of underinvestment (USCORE), and the sensitivity of executive compensation to firm value (ECSENS). I also include the marginal tax rate (MTR) to control for tax incentives. Cash flow volatility (CFV) and earnings volatility (EV) reflect general incentives to use derivatives (Zhang 2009; Chang et al. 2016). I also control for

substitutes to derivatives use: preferred stock (PSTOCK) and convertible debt (CDEBT) and risk exposure (IRISK, FRISK, CRISK).

DIS is a vector of voluntary disclosure incentives. As firms with higher proprietary costs and firms in more competitive industries are less likely to disclose the notional amount of derivatives, I control for firms' market share (MKT_SHARE) and the level of competition (HHI). CTRL is a vector of control variables that likely influence both the decision to disclose the notional amount of derivatives and the extent of derivatives use. I control for foreign activity (FI), mergers and acquisitions (M&A), size (SIZE), and firm profitability (ROA) (Chang et al. 2016). To avoid bias in standard errors estimates resulting from correlated residual errors in panel data, I follow the recommendation of Peterson (2009) and report standard errors clustered by firm and fiscal year. To correctly implement the Heckman (1979) two-stage procedure, I must exclude at least one-stage exogenous independent variable from the second stage. CP_USER is my exclusion restriction; it is negatively related to the decision to disclose the notional amount of derivatives, but unrelated to the extent of derivatives use.

Next, I examine whether the adoption of SFAS 161 leads to a change in the extent of speculative derivatives use. First, I estimate the extent of hedging (HEDGE) and speculation (SPECULATE) with derivatives. HEDGE is the predicted value from annual cross-sectional regressions of the notional amount of derivatives on firm characteristics that are associated with hedging (Eq. 2). SPECULATE is the absolute value of the residual from the same regression. To calculate HEDGE and SPECULATE, I exclude SFAS_161 and COST_D, as my analysis examines the differences in the means and medians of HEDGE and SPECULATE between the pre- and post-SFAS 161 periods for HC and LC firms. This measure has been used in prior studies as a proxy for speculation and assumes that the portion of the notional amount of derivatives that cannot be explained by hedging incentives is attributable to speculation (Brown et al. 2006; Beber and Fabbri 2012). It accounts for the amount of over- or under-hedging in the period. I expect a significant

increase (decrease) in SPECULATE after the adoption of SFAS 161 if firms are more speculative (prudent) after the adoption of mandatory hedge disclosures (H2a). Further, I expect a significant increase (decrease) in SPECULATE after the adoption of SFAS 161 for HC firms due to their higher cost of adopting mandatory hedge disclosures (H2b). I do not make any predictions for the hedging component (HEDGE), as theory is silent regarding this component of derivatives.

To test H3a and H3b, I examine the association between mandatory derivatives and hedge disclosures and the extent of derivatives designated and not designated as accounting hedges by estimating the following OLS regressions (variable definitions provided in Appendix A[5]):

$$NOTIONAL\_D\left(NOTIONAL\_ND\right) = {}_1 + {}_2 SFAS\_161 + {}_3 COSTD + {}_4 COSTD * SFAS\_161 + {}_5 CH\_USER + {}_6 LAG\_NOTIONAL + {}_7 FRISK + {}_8 IRISK + {}_9 CRISK + {}_{10} IMR + {}_{11} GDP\_GROWTH + \sum_x {}_x RMI_{it}^x + \sum_y {}_y DIS_{it}^y + \sum_z {}_z CTRL_{it}^z + £(3),$$

where NOTIONAL_D (NOTIONAL_ND) are the notional amount of derivatives designated (not designated) as accounting hedges, scaled by lagged total assets. All other variables are as defined above. I predict that the adoption of SFAS 161 is associated with a decrease (increase) in the extent of derivatives designated (not designated) as accounting hedges (H3a). I expect the coefficient β_2 to be negative (positive) and significant when the dependent variable is the notional amount of designated (non-designated) derivatives. The coefficient β_4 captures the effect of the adoption of SFAS 161 on the extent of designated and non-designated derivatives for HC firms, relative to LC firms. I expect the coefficient β_4 to be negative (positive) and significant when the dependent variable is the notional amount of designated (non-designated) derivatives (H3b). Because the impact of the cost of disclosure

[5] The results do not change if I model the equation as a Tobit regression rather than OLS. Out of the 1,939 observations, 434 and 898 are left-censored when the dependent variables are NOTIONAL_D and NOTIONAL_ND, respectively.

(COSTD) on the accounting designation of derivatives prior to the adoption of SFAS 161 is not clear, I make no predictions for β_3.

Finally, I examine whether the accounting designation of derivatives is informative of derivatives economic use and whether the adoption of SFAS 161 changes the hedge effectiveness of designated and non-designated derivatives. An ideal measure of the effectiveness of derivatives would consider the extent to which changes in the fair value of derivatives in fair value hedges offset changes in the fair value of firm net assets due to the risk being hedged and the extent to which changes in the fair value of derivatives in cash flow hedges offset firm's cash flows attributable to the risk hedged (i.e. foreign currency risk). However, such detailed information about derivatives and hedged items is not readily available. Therefore, I use pretax earnings before derivatives gains and losses as a proxy of cash flows and changes in fair value of net assets due to the risks the firm is exposed to, and I use pretax derivatives gains and losses as a proxy of the change in fair value of derivatives during the period. I create a measure of overall hedge effectiveness, as the extent to which derivatives gains and losses offset gains and losses before taxes and before derivatives.

$$NIBD = {}_1 + {}_2 LAG\_NI + {}_3 DERD\_GL + {}_4 DERND\_GL + {}_5 SFAS\_161 + {}_6 DERD\_GL * SFAS\_161 + {}_7 DERND\_GL * SFAS\_161 + £(4),$$

where NIBD is pretax net income before derivatives gains and losses, NI is pretax net income, and DERD_GL (DERND_GL) are the gains/losses related to designated (not designated) derivatives. All continuous variables are scaled by lagged total assets. I expect LAG_NI to be positively related to gains and losses before derivatives, but make no prediction for the effect of the adoption of SFAS 161 on pretax earnings (β_5). If firms use derivatives for hedging purposes, the derivatives gains and losses should offset gains and losses before derivatives and should be negatively related. If, on the other hand, derivatives are used for speculative purposes, the derivatives gains and losses may be either positively or negatively related to gains and losses before derivatives. Since both designated and non-

designated derivatives may be used for both speculative and hedging purposes, I make no predictions regarding the sign of the coefficients β_3 and β_4. Further, I make no predictions for the coefficients β_6 and β_7 since the adoption of SFAS 161 may lead to an increase or decrease in the extent of speculative derivatives in each category (H4).

6. RESULTS

Descriptive statistics

Table 3 reports descriptive statistics for measures of risk management incentives, voluntary disclosure incentives, and control variables, along with t-statistics for mean tests of differences between firms with a high and low cost of disclosure. Descriptive statistics suggest that LC and HC firms differ across several dimensions. Relative to LC firms, HC firms have significantly higher market share (MKT_SHARE), suggesting that HC firms have higher proprietary costs than LC firms. HC firms also have a higher probability of bankruptcy (ALTZ), higher underinvestment risk (USCORE), and lower sensitivity of executive compensation to firm value (ECSENS). Finally, HC firms have a greater proportion of foreign income (FI) and are more likely to be audited by a big 4 audit firm (BIGN) than LC firms.

Effect of SFAS 161 on the extent of derivatives used

Table 4 reports the results of estimating the first stage model (Eq. 1). The area under the ROC curve is 0.76, suggesting that the model has fair discriminatory power and the coefficients are generally consistent with prior research and predictions. For example, disclosure of notional amounts is negatively associated with industry competition (HHI), and the choice to use commodity price derivatives (CP_USER), and positively associated with the percentage of institutional ownership (INSTOWN). Further, the decision to disclose the notional amount of derivatives is positively associated with bankruptcy (ALTZ) and underinvestment risk (USCORE) and negatively associated with risk exposure (IRIS, CRISK). Finally, firms are more likely to disclose the notional amount of derivatives after the adoption of SFAS 161. The results imply that, compared to firms that disclose the notional, firms that do not disclose the notional amount operate in industries with more intense competition, have higher risk exposures and have lower monitoring. I use the coefficients from Eq.

(1) to construct an inverse Mills Ratio (IMR) that I then include in Eq. (2) and Eq. (3) to control for selection bias.

Table 5 reports the results of estimating Eq. (2), where I regress the notional amount of derivatives (NOTIONAL) on: a) a dummy variable that identifies fiscal years after the adoption of SFAS 161 (SFAS_161); b) a binary variable that captures the cost of disclosure associated with SFAS 161 (COSTD); c) the interaction between SFAS 161 and COSTD; and d) a number of firm characteristics that are associated with the extent of derivatives use. The main effect of SFAS 161 is not statistically significant (H1a), suggesting that overall, the extent of derivatives use is not different after the adoption of SFAS 161. However, I find that relative to LC firms, HC firms significantly reduce the extent of derivatives used after the adoption of SFAS 161. The coefficient for the interaction term (-0.011), representing the difference between the change in the extent of derivatives use for LC firms and the change in the extent of derivatives use for HC firms, is negative and significant. An F-test also indicates that the change in the extent of derivatives use for HC firms is significantly negative (p-value=0.05) (H1b).

The difference in the extent of derivatives use between the two periods for high cost firms is also economically significant as it suggests that the notional amount of derivatives after SFAS 161 is about 7.82% lower than before SFAS 161 was adopted. The average decrease in the extent of derivatives use for high cost firms is $113.54 million, and the aggregate decrease for the sample of firms with a high cost of disclosure is $43.48 billion. The upper bound for the average and aggregate reduction in the extent of derivatives use, calculated using the 95% confidence interval, are $327.05 million and $125.26 billion, respectively.

The coefficient for the proprietary cost proxy (COSTD) is positive and significant, while the coefficient for the interaction between COSTD and SFAS_161 is negative and significant. These results suggest that firms with a high cost of disclosure use derivatives to a greater extent than firms

with a low cost of disclosures prior to the adoption of SFAS 161, but an F test reveals that the difference is not significant after the adoption of the standard. This finding is in line with the argument made by Demarzo and Duffie (1991) that if firms have proprietary information, shareholders may not have enough information to adopt financial strategies. Therefore, firms may hedge on their behalf when hedging choices are not disclosed. However, if hedging choices are disclosed, these disclosures may reveal proprietary information, in which case the incentive to hedge on behalf of the shareholders is reduced.

The coefficients for the control variables are generally consistent with prior studies. The notional amount of derivatives is associated with hedging incentives, like the probability of bankruptcy (ALTZ) and underinvestment risk (USCORE). Further, the results suggest that firms with higher foreign income (FI) and more profitable firms (ROA) use derivatives to a greater extent. Finally, derivatives use is also associated with industry competition (HHI) and institutional ownership (INSTOWN).

Effect of SFAS 161 on the extent of speculative derivatives

Panels A and B of Table 6 report the results from the tests of differences in means (t-test) and medians (Wilcoxon rank-sum test), respectively, in the hedging (HEDGE) and speculative (SPECULATE) components of the notional amount of derivatives between the pre- and post-SFAS 161 periods. I do not find support for H2a, as the extent of speculation does not decrease significantly in the post-SFAS 161 period. However, consistent with more prudent risk management practices following mandatory derivatives disclosures for HC firms, I find that HC firms significantly reduce the extent of speculation with derivatives after the adoption of SFAS 161 (t-stat 2.355; z-stat 2.633) (H2b).

Further, the hedging component of derivatives (HEDGE) is not significantly different between the two periods for HC firms. However, the difference in medians of HEDGE between the

pre- and post-SFAS 161 periods for LC firms is significantly positive, while the difference in means is not. These results provide weak evidence of a decrease in the extent of hedging derivatives for LC firms following the adoption of SFAS 161. One explanation for this finding is that LC firms are changing how they account for derivatives, and using less designated and more non-designated derivatives. These accounting changes may also involve de-designating or terminating derivatives in hedging relations. Since the accounting designation of derivatives is related to their economic use, firms may be terminating some hedging derivatives after the adoption of SFAS 161. This may explain the weak decrease in hedging derivatives observed.

Effect of SFAS 161 on the accounting designation of derivatives

Table 7 reports the results of estimating Eq. (3), where the dependent variable is the notional amount of designated derivatives (NOTIONAL_D) in the first column and the notional amount of non-designated derivatives (NOTIONAL_ND) in the second column. When the dependent variable is the notional amount of designated derivatives, the estimated coefficients for SFAS 161 (-0.011) and the interaction between SFAS 161 and COSTD (-0.037) are negative and statistically significant. These results indicate that the use of derivatives designated as accounting hedges is lower after the adoption of SFAS 161 for both HC and LC firms. Further HC firms reduce designated derivatives use to a greater extent than LC firms after the adoption of mandatory derivatives disclosures. In the second column, the estimated coefficients for SFAS_161 (0.016) and the interaction between SFAS 161 and COSTD (0.021) are positive and statistically significant, suggesting that the extent of derivatives not designated as accounting hedges is higher for both HC and LC firms after the adoption of SFAS 161. However, relative to LC firms, HC firms increase their use of non-designated derivatives after the adoption of SFAS 161 to a greater extent than LC firms. The results are consistent with my hypothesis that firms use more non-designated and fewer designated derivatives after the adoption fi SFAS 161 to reduce the cost of disclosure imposed by the standard.

The difference in the extent of designated and non-designated derivatives use between the two periods for LC and HC firms is also economically significant. For example, LC (HC) firms reduce designated derivatives use by 13% (32%) and increase the extent to which they use non-designated derivatives by 41% (179%). The average decrease in the extent of designated derivatives use for LC (HC) firms is $94.69 million ($288.93 million), and the aggregate decrease for the sample is $136.94 billion. Similarly, the average increase in the extent of non-designated derivatives use for LC (HC) firms $132.60 million ($222.26 million), and the aggregate increase for the sample is $148.37 billion.

Further, the coefficient for COSTD is positive and significant in the first column, and negative and significant in the second column. This is consistent with the idea that firms with high proprietary costs act on behalf of the shareholders and hedge, not speculate when the hedging choices are not disclosed. As expected, the notional amount of derivatives designated as accounting hedges is related to firm characteristics that theory suggests are associated with hedging derivatives: the sensitivity of executives' compensation to firm value (ECSENS) and the marginal tax rate (MTR). The notional amount of non-designated derivatives is not significantly associated with hedging incentives. These results suggest that firms are more likely to use designated derivatives for hedging purposes.

Effect of SFAS 161 on hedge effectiveness

Table 8 reports the results from estimating Eq. (4), where the dependent variable is net income before taxes and derivatives. As expected, the gains and losses for derivatives designated as accounting hedges are negatively related to net income before derivatives gains ($p<0.01$), implying they are effective hedges of the firms' overall exposure. While the coefficient for gains and losses for non-designated derivatives is also negative, it is not statistically significant. This suggests that derivatives designated as accounting hedges are more likely to be used as hedging derivatives (H4a). The coefficient of the interaction term DERD_GL*SFAS_161 (0.002), representing the difference in hedge effectiveness of designated derivatives before and after the adoption of SFAS 161, is positive

and significant, indicating that the hedge effectiveness of designated derivatives decreased after the adoption of SFAS 161 (H4b). An F-test indicates that while hedge effectiveness decreases, designated derivatives are still effective hedges of firms' overall exposure after the adoption of SFAS 161 (p-value=0.05). This implies that while designated derivatives are highly effective hedges with respect to a financial statement item, and effective hedges with respect to the overall exposure of the firm, they are less effective after the adoption of SFAS 161.

7. CONCLUSION

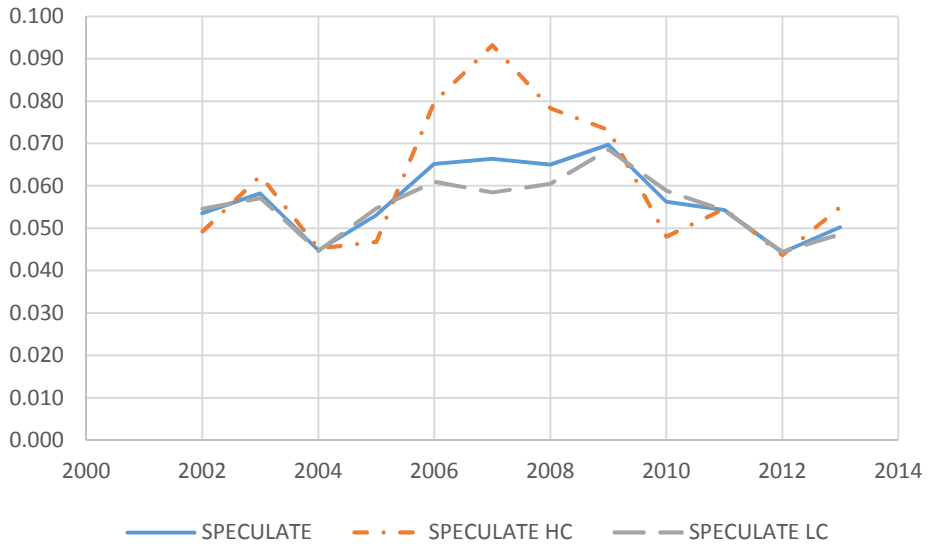
In my study, I evaluate the effect of mandatory derivatives disclosures on overall derivatives use, speculation with derivatives, and derivatives accounting designation. Theory predicts that firms may respond to mandatory derivatives and hedge disclosures by reducing the extent of derivatives use and increasing speculation with derivatives (Sapra 2002; Hoang and Ruckes 2013). SFAS 161 significantly expands disclosure requirements for derivatives and hedging activities and provides a setting to test these theoretical predictions. Because SFAS 161 requires fewer disclosures for non-designated derivatives, I also predict that firms will use fewer designated derivatives and more non-designated derivatives after the adoption of SFAS 161. I find that high disclosure cost (HC) firms reduce both the extent of derivatives use and the extent of speculative derivatives after the adoption of SFAS 161. Further, I find that both HC and low disclosure cost (LC) firms reduce (increase) the extent of designated (non-designated) derivatives, but the changes are more pronounced for HC firms. These findings are consistent with the view that disclosures of designated derivatives impose a higher proprietary cost for firms than disclosures of non-designated derivatives. Finally, I find that the accounting designation of derivatives is informative of their economic use, however, it is less informative after the adoption of SFAS 161.

Therefore, my results suggest that mandatory derivatives and hedge disclosures have real effects on how firms use derivatives and on the extent of speculation, and accounting effects on derivatives accounting designation. The findings in this study also present opportunities for future research. Future studies may investigate what factors determine the decision to designate derivatives for accounting purposes and how the market responds to this decision.

FIGURES AND TABLES

FIGURE 1

Panel A: Speculation over time



Panel B: Hedging over time

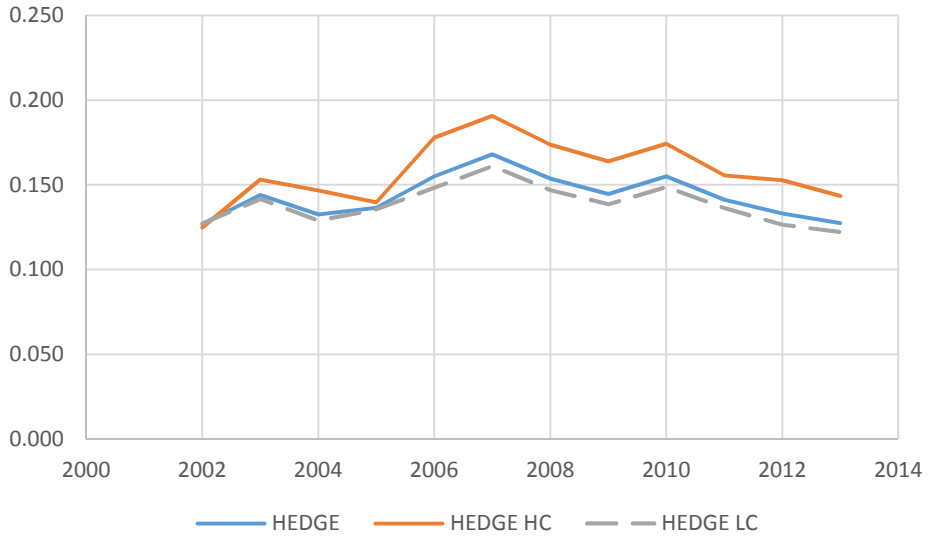


TABLE 1
Descriptive statistics – derivatives

Panel A: Temporal distribution of user observations, by risk exposure hedged

Fiscal year	*User*	*FX user*	*IR user*	*CP user*
2001	379	271	215	81
2002	385	277	226	86
2003	404	292	248	90
2004	417	298	254	90
2005	416	313	224	94
2006	419	321	219	102
2007	442	332	246	106
2008	457	349	237	122
2009	468	352	257	125
2010	450	346	239	118
2011	429	340	221	118
2012	419	334	200	111
2013	394	313	175	99
Total	5,479	4,138	2,961	1,342

Panel A reports the temporal distribution of different types of derivatives users. A firm is a User in fiscal year t if it reports a position in derivatives at the end of that fiscal year. A firm is a FX user, IR user, or CP user in fiscal year t if it reports a position in foreign exchange, interest rate, or commodity price derivatives at the end of that fiscal year.

Panel B: Number of firms with notional amounts disclosed, by fiscal year

Fiscal year	*Total*	*Designated/ non-designated*	*% Total disclosed*
2001	229	117	60.58
2002	225	114	58.59
2003	239	130	59.16
2004	247	136	59.38
2005	243	130	58.41
2006	238	131	56.80
2007	252	154	57.14
2008	278	191	60.83
2009	315	233	67.45
2010	306	226	68.00
2011	291	213	67.83
2012	280	211	66.83
2013	268	196	68.02
Total	3,411	2,182	62.31

The first column in Panel B shows the number of firms that disclose the notional amount of derivatives by fiscal year. The second column shows the number of firms that disclose the notional amount of derivatives by accounting designation. The third column shows the percentage of firms that report the notional amount of derivatives.

TABLE 1 (continued)
Panel C: Number of firms with gains/losses disclosed, by fiscal year

Fiscal year	*Total*	*By risk hedged*	*Designated/non-designated*	*By line item*	*% Total disclosed*
2001	44	35	21	16	11.64
2002	54	43	28	24	14.06
2003	56	43	28	24	13.86
2004	61	46	32	30	14.66
2005	64	53	36	35	15.38
2006	80	68	48	45	19.09
2007	118	104	87	79	26.76
2008	209	197	185	164	45.73
2009	385	372	365	345	82.44
2010	371	360	350	327	82.44
2011	354	344	334	315	82.52
2012	344	336	326	305	82.10
2013	321	314	306	285	81.47
Total	2,461	2,315	2,146	1,994	44.96

The first column in Panel C reports the number of firms that disclose the gains and losses related to derivatives by fiscal year. The second column reports the number of firms that disclose the gains and losses related to derivatives by risk hedged. The third column reports the number of firms that disclose the gains and losses related to derivatives by accounting designation. The fourth column reports the number of firms that disclose the gains and losses related to derivatives by income statement line item affected. The fifth column reports the percentage of firms that disclose total derivatives gains and losses.

Panel D: Number of firms with OCI derivatives data disclosed, by fiscal year

Fiscal year	*Net impact on OCI*	*Deferred and Transferred*
2001	182	80
2002	192	83
2003	205	88
2004	217	102
2005	229	110
2006	233	114
2007	260	139
2008	288	180
2009	328	279
2010	317	273
2011	311	268
2012	307	264
2013	278	245
Total	3,347	2,225

The first column in Panel D reports the number of firms that disclose the net derivatives gains and losses included in OCI by fiscal year. The second column reports the number of firms that disclose amounts deferred in OCI and transferred from OCI to earnings for derivatives in cash flow hedges.

TABLE 1 (continued)
Panel E: Disclosure score and change in disclosure score by fiscal year

Fiscal year	*Mean disclosure score*	*Change in disclosure score*
2001	0.997	.
2002	1.096	0.142
2003	1.099	0.218
2004	1.168	0.190
2005	1.257	0.220
2006	1.322	0.194
2007	1.507	0.330
2008	2.018	0.820
2009	4.348	2.942
2010	4.371	2.438
2011	4.434	0.159
2012	4.444	0.074
2013	4.388	0.028

Panel E reports descriptive statistics for the disclosure score and for the change in disclosure score, a self-constructed score based on the extent of derivatives disclosures. See Appendix C for details on the construction of the disclosure score.

Panel F: Industry distribution of sample observations

Fama-French 12 industries	*USERS*	*DISCL_COST=0*	*%*	*DISCL_COST=1*	*%*
Consumer Non-Durables	502	414	82.47	88	17.53
Consumer Durables	240	126	52.50	114	47.50
Manufacturing	936	625	66.77	311	33.23
Energy & Extraction	366	314	85.79	52	14.21
Chemicals & Allied Products	362	216	59.67	146	40.33
Business Equipment	1,251	1,017	81.29	234	18.71
Telecommunications	210	172	81.90	38	18.10
Wholesale & Retail	580	463	79.83	117	20.17
Healthcare	468	341	72.86	127	27.14
Contr., Transport & Services	564	467	82.80	97	17.20
Total	5,479	4,155	75.84	1,324	24.16

Panel F reports the industry distribution of derivatives users and the industry distribution of derivatives users by derivatives disclosure cost.

TABLE 2
Notional amount of derivatives, by fiscal year and hedge designation

Fiscal year	*Total derivatives*	*Designated derivatives*	*Non-designated derivatives*
2001	0.132	0.096	0.024
2002	0.132	0.087	0.029
2003	0.143	0.103	0.030
2004	0.133	0.095	0.027
2005	0.134	0.092	0.030
2006	0.152	0.107	0.032
2007	0.166	0.111	0.035
2008	0.151	0.097	0.042
2009	0.141	0.081	0.052
2010	0.159	0.093	0.055
2011	0.141	0.083	0.050
2012	0.133	0.073	0.052
2013	0.126	0.072	0.051
Total	0.142	0.090	0.042

The first column of Table 2 reports the notional amount of total derivatives as a percentage of lagged total assets by fiscal year. Columns 2 and 3 present the notional amount of total designated and non-designated derivatives as a percentage of lagged total assets by fiscal year.

TABLE 3
Descriptive statistics

	DISCL_COST=0			***DISCL_COST =1***			
VARIABLE	Obs	Mean	Std Dev	Obs	Mean	Std Dev	t-stat
RISK MANAGEMENT INCENTIVES							
ALTZ	4,155	3.463	2.911	1,324	3.302	2.542	**1.8003**
USCORE	4,155	0.371	0.186	1,324	0.389	0.173	**-3.107**
ECSENS	4,155	0.993	2.678	1,324	0.679	1.745	**4.001**
MTR	4,155	0.301	0.103	1,324	0.301	0.104	-0.080
CFV	4,155	0.560	0.866	1,324	0.525	0.784	1.313
EV	4,155	1.817	4.546	1,324	1.707	4.771	0.759
PSTOCK	4,155	0.002	0.013	1,324	0.001	0.007	**3.699**
CDEBT	4,155	0.027	0.072	1,324	0.023	0.067	**1.785**
FRISK	4,155	0.013	0.013	1,324	0.013	0.013	1.626
IRISK	4,155	0.002	0.003	1,324	0.002	0.003	0.799
CRISK	4,155	0.013	0.013	1,324	0.012	0.012	**2.465**
VOLUNTARY DISCLOSURE INCENTIVES							
MKT_SHARE	4,155	0.190	0.238	1,324	0.211	0.271	**-2.651**
HHI	4,155	-0.096	0.079	1,324	-0.095	0.075	-0.707
CONTROLS							
FI	4,155	0.035	0.046	1,324	0.040	0.048	**-3.400**
BIGN	4,155	0.975	0.155	1,324	0.992	0.087	**-3.810**
MA	4,155	0.562	0.496	1,324	0.606	0.489	**-2.790**
SIZE	4,155	8.580	1.338	1,324	8.520	1.168	1.461
ROA	4,155	0.020	0.025	1,324	0.021	0.024	-1.214
INSTOWN	4,155	0.658	0.300	1,324	0.649	0.300	1.040
IMR	4,155	0.642	0.419	1,324	0.678	0.403	**-2.730**

Table 3 reports descriptive statistics for firms with a low and high cost of disclosing derivatives related information (DISCL_COST=0, DISCL_COST=1). Bold t-statistics denote significance at 0.10 (two-tailed) for mean tests of differences between firms with a high and low cost of derivatives disclosures. All continuous variables are winsorized at 1st and 99th percentile. All variables are defined in Appendix A.

TABLE 4
First stage model

		NOTIONAL_DISCL		
	Exp.	Coeff.		RSE
MKT_SHARE	-	-0.168		0.292
HHI	-	-0.660	**	0.378
ECSENS	+/-	0.006		0.013
CP_USER	-	-1.148	***	0.127
INSTOWN	+	0.202	*	0.162
SIZE	+/-	-0.081		0.041
ROA	+/-	0.596		1.797
BIGN	+	-0.013		0.283
SFAS_161	+/-	0.250	***	0.074
COSTD	+	0.047		0.114
ALTZ	+/-	-0.038	*	0.021
USCORE	+/-	0.498	**	0.235
MTR	+/-	-0.034		0.238
CFV	+/-	-0.050		0.043
EV	+/-	-0.010	*	0.005
PSTOCK	+/-	-0.003		2.751
CDEBT	+/-	-0.817		0.594
FI	+/-	1.563		1.033
FRISK	+/-	0.639		2.083
IRISK	+/-	-15.071	*	8.958
CRISK	+/-	-4.191	**	2.185
MA	+/-	0.070		0.071
GDP	+/-	-0.668		1.117
INTERCEPT	+/-	1.119	**	0.479
Industry FF	Included			
Pseudo R^2	18.40%			
Area under ROC curve	0.76			
Observations	5,479			

This table reports results of estimating the first stage model (Eq. (1)) using a probit regression, where the dependent variable (NOTIONAL_DISCL) is coded 1 for firms that disclose the notional amount of derivatives, and 0 otherwise. *, **, and *** denote statistical significance levels of 0.10, 0.05, and 0.01, respectively (two-tailed for non-signed and one tailed for signed tests). Robust standard errors (RSE) are clustered by firm. All variables are defined in Appendix A.

TABLE 5
Effect of the adoption of SFAS 161 on the extent of derivatives used

		NOTIONAL		
	Exp	Coeff.		RSE
SFAS_161	-	-0.002		0.006
COSTD	+/-	0.014	***	0.003
*COSTD*SFAS_161*	-	-0.011	**	0.006
CH_USER	+	0.048	***	0.006
LAG_NOTIONAL	+	0.748	***	0.026
ALTZ	-	-0.002	**	0.001
USCORE	+	0.023	***	0.008
ECSENS	+	0.000		0.001
MTR	+	0.011		0.018
CFV	+/-	-0.003		0.003
EV	+/-	0.000		0.000
PSTOCK	-	0.543	*	0.298
CDEBT	-	0.074	**	0.037
FI	+/-	0.141	***	0.036
FRISK	+/-	0.098		0.148
IRISK	+/-	1.163		0.716
CRISK	+/-	0.005		0.158
MKT_SHARE	+/-	0.002		0.010
HHI	+	0.026	***	0.008
BIGN	+/-	-0.019		0.014
MA	+/-	-0.014	***	0.002
SIZE	+	0.001		0.001
ROA	+/-	0.204	*	0.116
INSTOWN	+/-	-0.023	**	0.011
GDP_GROWTH	+/-	0.140		0.098
IMR	+/-	-0.016	**	0.008
INTERCEPT	+/-	0.062	***	0.023
Adjusted R^2	60.04%			
Observations	3,012			
*F-test: SFAS_161+COSTD*SFAS_161=0*		3.19	**	

This table reports results of estimating Eq. (2) using an OLS regression, where the dependent variable is the notional amount of derivatives (NOTIONAL). *, **, and *** denote statistical significance levels of 0.10, 0.05, and 0.01, respectively (two-tailed for non-signed and one tailed for signed tests). Robust standard errors (RSE) are clustered by firm and fiscal year (Petersen 2009). All variables are defined in Appendix A.

TABLE 6
Change in hedging and speculation after the adoption of SFAS 161

Panel A: Mean difference tests

	HEDGE		*SPECULATE*	
	HC	LC	HC	LC
Pre-SFAS 161	0.160 (383)	0.141 (1,292)	0.066 (383)	0.056 (1,292)
Post-SFAS 161	0.160 (337)	0.135 (1,000)	0.054 (337)	0.055 (1,000)
t-test	-0.039	1.289	**2.355**	0.161
p-value			0.019	

Panel B: Median difference tests

	HEDGE		*SPECULATE*	
	HC	LC	HC	LC
Pre-SFAS 161	0.128 (383)	0.106 (1,292)	0.041 (383)	0.037 (1,292)
Post-SFAS 161	0.137 (337)	0.100 (1,000)	0.033 (337)	0.035 (1,000)
z-test	0.832	**2.090**	**2.663**	0.889
p-value		0.037	0.008	

This table reports the tests of differences in means (t-tests) and medians (Wilcoxon rank-sum test) in the hedging and speculative components of the notional amount of derivatives between the pre- and post-SFAS 161 periods. HEDGE is the predicted value from annual cross-sectional regressions of the notional amount of derivatives on firm fundamentals. SPECULATE is the absolute value of the residuals from the same regression. The number of observations in each category is reported in parentheses. All variables are defined in Appendix A.

TABLE 7
Effect of the adoption of SFAS 161 on the accounting designation of derivatives

		NOTIONAL_D			***NOTIONAL_ND***		
	Exp	Coeff.		RSE	Coeff.		RSE
SFAS_161	+/-	-0.011	***	0.005	0.016	***	0.004
COSTD	+/-	0.050	***	0.011	-0.025	***	0.008
*COSTD*SFAS_161*	+/-	-0.037	***	0.011	0.021	***	0.009
CH_USER	+	0.036	***	0.007	0.009	***	0.002
LAG_NOTIONAL	+/-	0.396	***	0.046	0.226	***	0.031
ALTZ	-	-0.002		0.002	0.001		0.001
USCORE	+	0.035		0.030	-0.001		0.021
ECSENS	+	0.002	*	0.001	0.000		0.001
MTR	+	0.042	***	0.016	-0.019		0.014
CFV	+/-	-0.001		0.005	0.000		0.003
EV	+/-	0.000		0.000	0.000		0.000
PSTOCK	-	0.322		0.427	-0.001		0.142
CDEBT	-	-0.054		0.048	0.050		0.041
FI	+/-	0.146		0.117	0.045		0.111
FRISK	+/-	0.093		0.193	0.038		0.163
IRISK	+/-	0.517		0.656	0.856	*	0.475
CRISK	+/-	-0.079		0.183	-0.027		0.135
MKT_SHARE	+/-	0.025		0.017	-0.008		0.014
HHI	+	0.038		0.023	0.007		0.018
BIGN	+/-	-0.005		0.018	-0.010		0.018
MA	+/-	-0.009	*	0.005	0.000		0.004
SIZE	+	0.005	*	0.003	-0.002		0.003
ROA	+/-	-0.085		0.161	0.062		0.188
INSTOWN	+/-	-0.006		0.015	-0.011		0.011
GDP_GROWTH	+/-	0.390	***	0.109	-0.186	***	0.053
IMR	+/-	0.000		0.014	-0.005		0.009
INTERCEPT	+/-	-0.022		0.036	0.053		0.035
Adjusted R^2		36.24%			21.83%		
Observations		1,939			1,939		

This table reports results of estimating Eq. (3) using an OLS regression, where the dependent variable is the notional amount of designated derivatives (NOTIONAL_D) in the first column, and the notional amount of non-designated derivatives (NOTIONAL_ND) in the second column. *, **, and *** denote statistical significance levels of 0.10, 0.05, and 0.01, respectively (two-tailed for non-signed and one tailed for signed tests). Robust standard errors (RSE) are clustered by firm and fiscal year (Petersen 2009). All variables are defined in Appendix A.

TABLE 8
Effect of the adoption of SFAS 161 on hedge effectiveness

		NIBD		
	Exp.	Coeff.		RSE
LAG_NI	+	0.61876	***	0.06386
DERD_GL	-	-0.00217	***	0.00036
DERND_GL	-	-0.00026		0.00078
SFAS_161	+/-	0.02608	**	0.01070
*DERD_GL *SFAS_161*	+/-	0.00152	**	0.00061
*DERND_GL *SFAS_161*	+/-	0.00016		0.00085
INTERCEPT	+/-	0.01174		0.01116
Adjusted R^2	43.42%			
Observations	2,090			
*F-test: DERD_GL + DERD_GL *SFAS_161=0*		3.40	**	

This table reports results of estimating Eq. (4) using an OLS regression, where the dependent variable is net income before taxes and before derivatives gains and losses (NIBD). *, **, and *** denote statistical significance levels of 0.10, 0.05, and 0.01, respectively (two-tailed for non-signed and one tailed for signed tests). Robust standard errors (RSE) are clustered by fiscal year. All variables are defined in Appendix A.

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APPENDIX A – VARIABLE DEFINITIONS

Derivatives variables	
USER	Indicator variable equal to 1 if the firm uses derivatives at year t, and 0 otherwise. Hand-collected from Form 10-K.
CP_USER	Indicator variable equal to 1 if the firm uses commodity price derivatives at year t, and 0 otherwise. Hand-collected from Form 10-K.
CH_USER	Change in the number of risks hedged (interest rate risk, foreign exchange risk, commodity price risk). Hand-collected from Form 10-K.
NOTIONAL	Notional value of derivatives designated as accounting hedges divided by lagged total assets (at). Hand-collected from Form 10-K.
NOTIONAL_D	Notional value of derivatives designated as accounting hedges divided by lagged total assets (at). Hand-collected from Form 10-K.
NOTIONAL_ND	Notional value of derivatives not designated as accounting hedges divided by lagged total assets (at). Hand-collected from Form 10-K.
HEDGE	Predicted value of the hedging component from the regression of the notional amount of derivatives on firm fundamentals.
SPECULATE	The absolute value of the residual from a regression of the notional amount of derivatives on fundamentals. See Beber and Fabbri (2012).
NI	Income before taxes (pi) divided by lagged total assets (at).
NIBD	Income before taxes (pi) less derivatives gains and losses (hand-collected from Form 10-K), divided by lagged total assets (at).
DER_GL	Derivatives gains and losses, divided by lagged total assets (at). Hand-collected from Form 10-K.
DERD_GL	Designated derivatives gains and losses, divided by lagged total assets (at). Hand-collected from Form 10-K.
DERND_GL	Non-designated derivatives gains and losses, divided by lagged total assets (at). Hand-collected from Form 10-K.
DISCL	Self-constructed measure based on the level of derivatives disclosures in Form 10-K. Takes values from zero to six. Hand-collected from Form 10-K. See Appendix C for details. (Chalmers and Godfrey 2004).
CH_DISCL	Change in disclosure level (DISCL) from year t-2 to year t.

Derivatives variables (continued)	
COSTD	Coded 1 for firms that have to make a large change in disclosure levels (>4) (HC) in the fiscal year SFAS 161 is adopted and 0 otherwise (LC). The firms coded 1 are in the top 25th percentile.
SFAS_161	Indicator variable equal to 1 for fiscal years beginning after November 15 2008, the effective date for SFAS 161.
Risk management incentives	
ALTZ	Likelihood of entering financial distress, defined as the modified Altman-Z score based on parameter weights reported by Shumway (2001). See Donohoe (2015).
USCORE	Likelihood of underinvestment, defined by first ranking cash flow from operations (oancf), debt-to-assets ratio (lt/at), and scores from a factor analysis of four growth opportunity measures (prior investment activity, geometric growth in market value of assets, market-to- book ratio, and research and development expense) into deciles by year and industry. Decile ranks for debt-to- asset ratios and growth opportunity factor scores are then added to the reverse decile rank for cash flow from operations, with the result scaled by 30 (total possible points). See Donohoe (2015).
ECSENS	Sensitivity of executive compensation to firm value, defined by first computing the dollar change in value of CEO stock and option holdings that would result from a one percentage point increase in the stock price of the firm (0.01*prcc_f*[shrown_tot+opt_unex_exer_num]). The result is then normalized by the sum of CEO salary and bonus (salary+bonus) to capture the share of total CEO compensation that would result from a one percentage point increase in firm value. Compensation data obtained from Execucomp. See Donohoe (2015).
MTR	Marginal tax rate. See Blouin, Core, and Guay (2010).
EV	Earnings volatility, defined as the standard deviation of earnings before extraordinary items (ib) during the most recent five years scaled by the absolute value of the mean of earnings before extraordinary items over the same five-year period.

Risk management incentives (continued)	
CFV	Cash flow volatility, defined as the standard deviation of operating cash flows (oancf) during the most recent five years scaled by the absolute value of the mean of operating cash flows over the same five-year period.
PSTOCK	Preferred stock, defined as preferred stock (pstk) divided by lagged total assets (at).
CDEBT	Convertible debt, defined as convertible debt (dcvt) divided by lagged total assets (at).
Risk exposure variables	
IRISK	Interest rate risk exposure, defined as the absolute value of the coefficient from a regression of firms' monthly holding period stock returns on the monthly percentage change in the London Interbank Offered Rate (LIBOR) for 24 months prior to fiscal-year end. See Guay (1999), Zhang (2009), and Donohoe (2015).
FRISK	Foreign currency exchange rate risk exposure, defined as the absolute value of the estimated coefficient from a regression of firms' monthly holding period stock returns on the monthly percentage change in the Federal Reserve Board trade-weighted U.S. dollar index for 24 months prior to fiscal-year end. See Guay (1999), Zhang (2009), and Donohoe (2015).
CRISK	Commodity price risk exposures, defined as the absolute value of the estimated coefficient from a regression of firms' monthly holding period stock returns on the monthly percentage change in the Producer Price Index for 24 months prior to fiscal-year end. See Guay (1999), Zhang (2009), and Donohoe (2015).
Controls	
FI	Foreign income, defined as pre-tax foreign income (pifo) divided by lagged total assets (at).
MA	Indicator variable equal to 1 if cash flow from mergers and acquisitions (aqc) is not equal to 0, and 0 otherwise.
SIZE	Firm size, defined as the log of total assets (at).
BIGN	Indicator variable equal to 1 if auditor is a Big 4/5 firm, and 0 otherwise.

Controls (continued)	
ROA	Return on assets, defined as pre-tax income (pi) divided by average total assets (at).
INSTOWN	Institutional ownership, defined as the percentage of common shares held by institutions at the end of the calendar quarter closest to firms' fiscal year-end obtained from Thomson Reuters. The percentage of common shares held by institutions at the end of a calendar quarter is calculated as the sum of a firm's shares held by each institution divided by total outstanding common shares.
GDP_GROWTH	Percentage change in gross domestic product between year t and t-1. Source: Compustat Economic Indicators.
IMR	Inverse Mills ratio calculated based on the coefficient estimates from Eq. (1).
Voluntary disclosure variables	
MKT_SHARE	Market value of equity (prcc_f*csho) divided by industry market value of equity (industry defined as 3-digit SIC code).
HHI	Herfindahl index, defined as sum of squared market share for each industry-year. Market share is calculated as firm revenue (sale) divided by industry revenue using all available Compustat data (industry defined as 3-digit SIC code) multiplied by (-1).

APPENDIX B – QUANTITATIVE DISCLOSURES

Quantitative disclosures SFAS 133

Derivatives designated as cash flow (CF) or fair value (FV) hedges	
Income statement	Gain/loss recognized in earnings representing hedge ineffectiveness Gain/loss excluded from hedge effectiveness Amount reclassified into earnings as a result of discontinued CF hedges Gain/loss recognized in earnings when a hedged firm commitment no longer qualifies as a FV hedge
Balance sheet	No disclosures required
OCI	Estimate of the amount to be reclassified from OCI into earning in the next 12 months (CF hedges)
Non-designated derivatives	
Income statement	No disclosures required
Balance sheet	No disclosures required
OCI	N/A

Quantitative disclosures SFAS 161

Derivatives designated as cash flow (CF) or fair value (FV) hedges	
Income statement	Amount reclassified into earnings as a result of discontinued CF hedges Gain/loss recognized in earnings when a hedged firm commitment no longer qualifies as a FV hedge Gains and losses included in the income statement Gains and losses presented separately for derivatives in CF and FV hedges Gains and losses presented separately by type of derivative Location and amount of gains and losses in the income statement Gains and losses on the hedged item (FV hedge)
Balance sheet	Fair value amounts presented as separate asset and liability values Fair value amounts presented separately for designated and non-designated derivatives Fair value amounts presented separately by type of derivatives Balance sheet line item that includes fair value amounts
OCI	Estimate of amount to be reclassified from OCI into earning in the next 12 months (CF hedges) Gains and losses recognized in OCI (CF hedges) Gains and losses reclassified from OCI into earnings (CF hedges)
Non-designated derivatives	
Income statement	Gains and losses included in the income statement Gains and losses presented separately by type of derivative Location and amount of gains and losses in the income statement
Balance sheet	Fair value amounts presented as separate asset and liability values Fair value amounts presented separately for designated and non-designated derivatives Fair value amounts presented separately by type of derivatives Balance sheet line item that includes fair value amounts
OCI	N/A

APPENDIX C – CALCULATION OF THE DISCLOSURE SCORE

Total gain/losses of derivatives are disclosed	1pt
Gain/losses disclosed by type of risk hedged (interest rate, foreign exchange, commodity price, equity price)	1 pt
Gain/losses disclosed separately for designated and non-designated derivatives	1 pt
Gain/losses disclosed by income statement line item	1 pt
Net impact on OCI disclosed	1 pt
Impact on OCI disaggregated between deferred gains/losses on cash flow hedges and amount transferred to income	1 pt
Maximum score	6 pts